JPRS-WST-84-001

4 January 1984

West Europe Report

SCIENCE AND TECHNOLOGY

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JPRS-JAR-84-001

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JPRS: Indicates that the report was published by the Joint Publications Research Service

JAR: Trigraph code for the JAPAN REPORT

84: Indicates the year in which the report was published

001: First report in the series. Each report series will have a separate numbering system that will begin with 001 on 1 January every year and will end on 31 December every year with whatever 3-digit number has been reached.

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JPRS-WST-84-001

4 January 1984

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

CONTENTS

FACTORY AUTOMATION

MICROELECTRONICS

SCIENTIFIC AND INDUSTRIAL POLICY

BRIEFS

NEW FRENCH AEROSPACE CENTER--Mr Hubert Curien, president of the National Center for Space Studies (CNES), was elected president of the National Air and Space Academy on 21 November in Toulouse, the same day the Academy was inaugurated in that city. This academy, the first to be decentralized from Paris to the provinces, was created through the initiative of Mr. Andre Turcat, the first test pilot for the Concorde supersonic airplane. The new institution's official birth certificate was signed in Toulouse on 21 November, the anniversary of the first balloon flight by Jean-Francois Pilatre de Rozier and the Marquis Francois d'Arlande, two hudnred years ago. The aim of the Air and Space Academy is "to promote the development of high-quality scientific, technical and cultural activities in the field of air and space." The Academy also plans "to deepen and enrich our scientific, technical and cultural heritage, to disseminate knowledge and to be a focus for ideas." Using French expertise and equipment, this center, which is unique in Europe and which is located close to the CNES in Toulouse, is designed to train foreign engineers and technicians from various fields. This task will be distributed among five sections: scientific knowledge; applied science and technology; the human presence; ethics, law, sociology and economics; and finally aerospace-related art, history and letters. [Excerpts] [Paris AFP SCIENCES in French 24 Nov 83 p 5] 8838

CSO: 3698/160

SAAB CLAIMS WORLD'S MOST MODERN ENGINE-ASSEMBLY PLANT

Stockholm NY TEKNIK in Swedish 13 Oct 83 pp 30-31

[Article by Ulf Bergmark]

[Text] The engine for the Saab 99 and 900 is assembled in one of the world's most advanced assembly plants. Robots do the heavy lifting and the time-consuming screw driving.

The plant may become a golden egg for ASEA [Swedish General Electric Corporation], which subsidized Saab-Scania's development of it. The reason is that ASEA can sell the advanced assembly technology to Saab's competitors.

Nine out of 10 workers at the gasoline engine plant in Sodertalje are women. Assembly work has traditionally been viewed as "lighter" work. But that is only partly true. Heavy lifting and such monotonous tasks as driving screws take their toll on the body and lead to aches and absences due to sickness.

Only robots and automation can take over the heavy jobs.

So say Lars-Goran Johansson, Stellan Hahlin, and Bjorn Biskop, the production experts responsible for the operation. Together with the union, the company health department, the industrial truck manufacturer (Construction and Transportation Economy), and a few other Swedish firms, they have developed the world's most advanced engine assembly plant.

Old Equipment

The reason for doing so at this particular time was that the old equipment in the engine plant was on its last legs. Production had to be increased, and it would not have paid to add to an old technology. The Scania Division, which builds the engines, therefore invested in something entirely new.

It is too early to say whether the working environment has become that much better in comparison with the old team assembly system. The plant has only been in operation since the summer vacation.

More Uniform Production

On the other hand, it is clear that automation can provide more uniform production and quality. Thanks to automation, all components can be tested before the engine undergoes its final road test. One example is the machine that drives screws in the cylinder heads. It shows values for the torque and torsional angle of each screw.

Over a period of 5 hectic weeks, the old equipment was ripped out of the gasoline engine plant. The floor was torn up, and tracks for the loop-traveling transporter trucks were poured. The equipment was installed and tested.

Robots Are Cheap

Robots are cheaper than large special machines. Automation cost only a little under 20 million kronor. That is the price of six robots, two so-called taxi trucks, and 35 assembly trolleys.

The robots are also flexible. It is easy to make changes when production runs are short, and that is a vital argument in their favor, since Saab-Scania is one of the world's smallest manufacturers of passenger cars. About 30 variants of the engine are currently being produced, and this means that each engine type is produced in relatively very small batches.

Ten small computers control their own portions of the assembly process. There is no large computer overseeing the operation as a whole. This makes it much easier to break the system in and also makes it much easier to change if, for example, any of the stations needs to be expanded.

Not Big Enough

The big problem at the moment is that the plant is not big enough. The production ceiling of 100,000 engines annually has been reached. When reconstruction began to be sketched out a few years ago, annual production was 70,000 engines.

If demand for the Saab 900 rises rapidly, plant management will either have to get union approval for starting a night shift or expand rapidly. An expansion is planned for next summer.

So far, automation has not caused anyone to lose his job. The robots have simply taken over the increase in production.

The plant is not a secret, even though it is so advanced. Visitors are beginning to be allowed in. Those most eager to come and have a look are auto manufacturers from other firms.

Stellan Hahlin says: "There is a gentleman's agreement among auto manufacturers. We learn from each other when it comes to production engineering."

Hard To Plagiarize

"We are not particularly afraid of industrial espionage. Each plant is tailor-made. Anyone who thinks it is possible to plagiarize is mistaken."

Saab-Scania has neither the resources for nor an interest in selling its production engineering to its competitors. It is primarily ASEA that may make money from the new assembly system.

ASEA has already sold industrial robots to a number of auto manufacturers around the world. Volvo and Saab-Scania, for example, have welding robots, and so do Mercedes, Audi, and General Motors and Ford in the United States. West German Ford uses ASEA robots to remove burrs from castings. BMW also has ASEA robots, and GM in Australia uses the Swedish robot to cement windshields.

Saab-Scania accepts the idea that its own plant will be a demonstration plant for ASEA, because ASEA assumed a great deal of the total responsibility for the project.

On the other hand, there is great annoyance at the fact that an advanced tool for installing valve keepers has been patented by ASEA. Saab technicians were the originators of that tool and participated in its development.

Winner for ASEA?

ASEA says that the tool was developed by ASEA at Saab-Scania's request and that all ideas come from ASEA.

The installing tool, which is described below, may become the real winner for ASEA, which manufactures it, since the tool makes it possible for the first time to rationalize the very time-consuming assembly of valves in cylinder blocks. The trend is toward energy-efficient engines with 16 valves instead of the current 8 in a four-cylinder engine. The greater number of valves will quickly make it profitable to replace a worker with a robot.

[Caption and key for illustrations on the following page:]

The small valve keepers shown in the lower right-hand drawing are installed with a very advanced tool. The large drawing shows how the tool compresses the valve spring so that the keeper can slide into place. A keeper is a sort of locking ring that holds the spring on the valve.

Key:

1. Keeper
2. Feed
3. Feed channel
4. Sensor that signals when the keeper has passed
5. Keeper guide
6. Keeper chute
7. Outer piece that compresses the spring
8. Cylinder head
9. Valve spring
10. Valve stem

Magnesium is used for a number of components in the experimental cars: engine block, brackets, intake manifold, wheel rims, and so on, for a total of 50 kilograms. The result is a weight reduction of 200 kilograms compared to using steel for those components.

Aluminum

The brake discs in front and the drums in the rear are made of aluminum with a plasma-sprayed iron surface. They were developed by Volvo in cooperation with Hoganas. A production study concerning the discs will soon be completed. The reduction in weight and aluminum's excellent heat dissipating properties make it worthwhile to begin using aluminum brake discs even now.

Production

The assembly line will be scrapped if the Volvo LCP goes into production. Most of the assembly work will be done in small units by subcontractors.

That is possible because most of the components are preassembled in modules that are easily combined to make a car.

The module concept reduces assembly time by one-third and makes the job easier to automate.

It is a radical production philosophy, and it was worked out in close cooperation with production experts within the firm.

Large portions of the car are glued instead of being welded. This is a necessary technique when many different materials are to be joined. Gluing is becoming increasingly common in the aircraft industry.

The disadvantage of gluing is its injurious fumes, and this is especially true of epoxy cement. Another disadvantage is the fact that it is laborious precision work.

Robots Do the Gluing

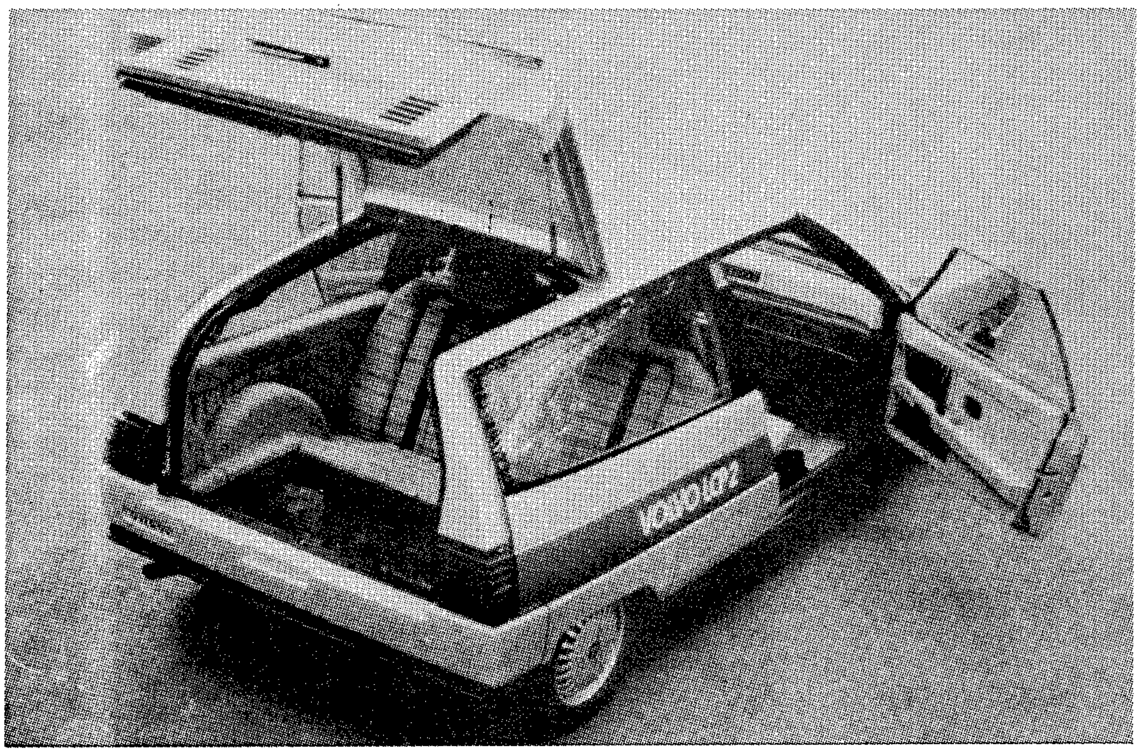
The solution will be to let industrial robots take over the gluing work.

Most of the materials used are stainless, primarily because plastic, aluminum, and magnesium are lighter than steel. But several dozen kilograms are also saved in the weight of the underframe.

The frame is of aluminum. But a plastic lower shell is also going to be tested, and this will include collision tests. Using plastic would make it possible to reduce the number of components in the lower shell from 43 to 6. Plastic also has much better sound-deadening qualities. The problem is to construct a durable lower shell while keeping the plastic from being too expensive or too heavy. The roof, hood, and outside panels are made of glass-fiber-reinforced polyester. The side and rear windows are made of polycarbonate. Polyamide, polyester, and carbon fiber are other plastics used in the car.

The modular system and all the plastic components will make it more difficult to repair the car in the usual way. Many parts will therefore be sent out for reconditioning in an exchange system.

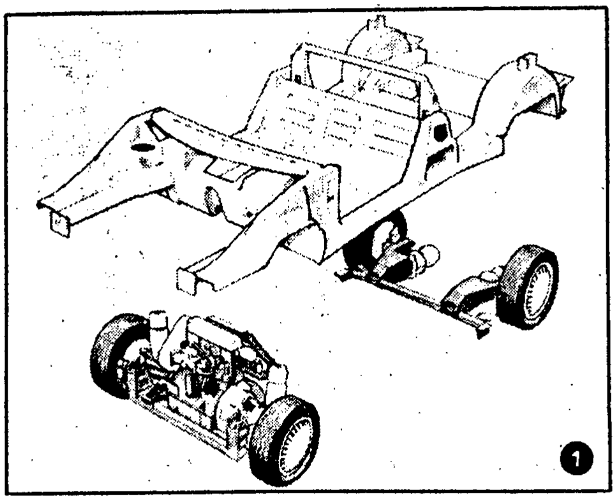
Rolf Mellde says: "That may reduce repair bills and provide more uniform quality in the work done."



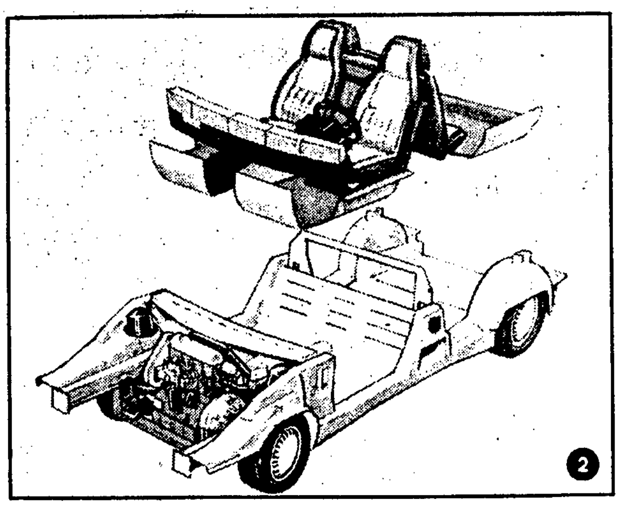
The Volvo 2000 is a car with unusual characteristics. New and lighter materials are glued together to avoid the weight due to today's welding process.

The car has large openings for entry and exit. The rear hatch includes half of the roof to provide an opening big enough for comfortable entry to the rear seats, which face backward.

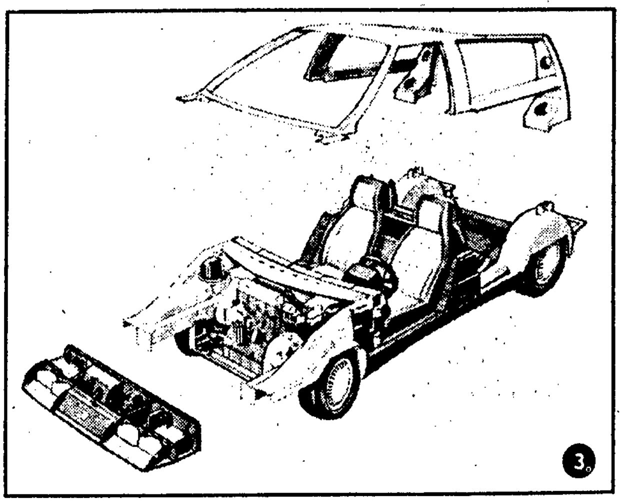
A three-cylinder direct fuel-injected diesel engine--with either a water-cooled aluminum block or one of oil-cooled cast iron--was the solution chosen by the engine builders for keeping fuel consumption to a maximum of 4 liters per 100 kilometers.



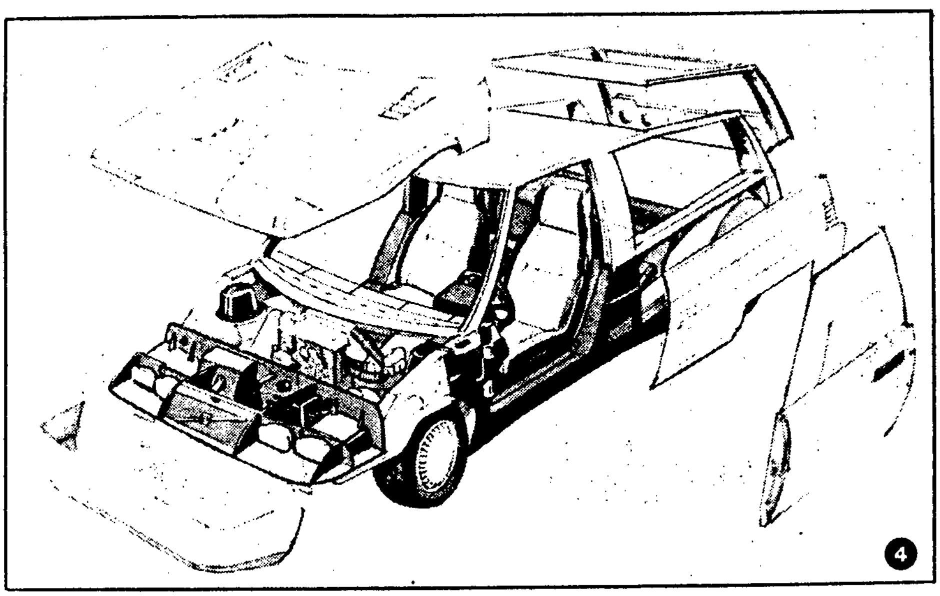
The underframe is joined to preassembled components such as front and rear axle assemblies, engine, and gear box.



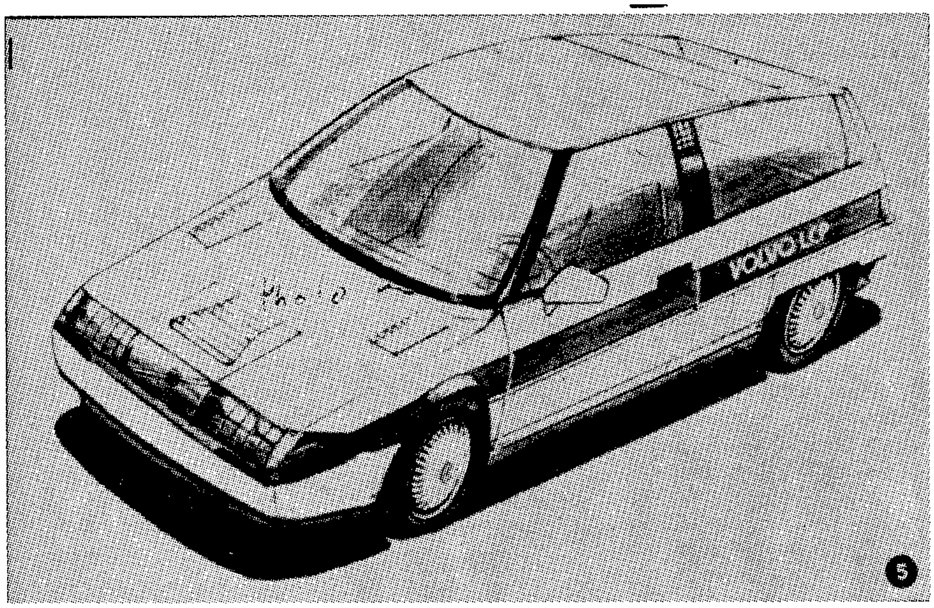
All the interior fittings, including seats, instrument panel, steering wheel, and pedals, are then lifted into the car.



In the next step, the front and superstructure are added. The car can now be driven, and any defects can easily be corrected.



As the last step, fenders, rear hatch, doors, hood, and front panel are installed. These parts are made of plastic in order to reduce weight.

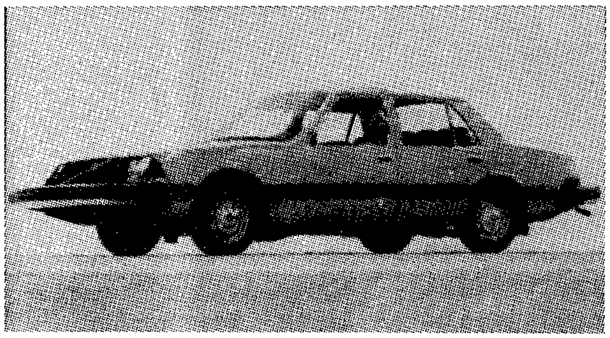


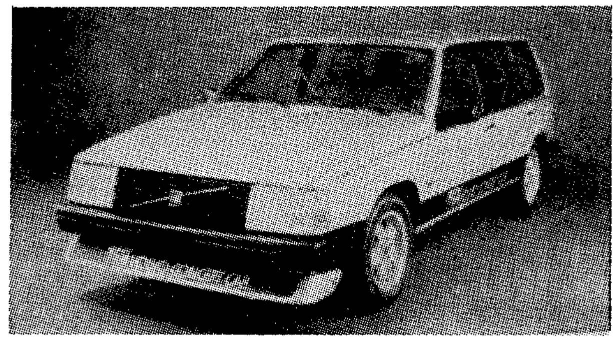
The result is the Volvo Light Component car, an energy-efficient automobile that weighs only about 700 kilograms and uses 4 liters of fuel per 100 kilometers.

From Experimental Cars to Mass Production

Project cars are built and rejected and disappear in the history of automobiles as documents of time. However, Volvo's project cars which have been shown to the public are usually quite close to the future mass-produced models.

Photo 1979 Photo [illegible]



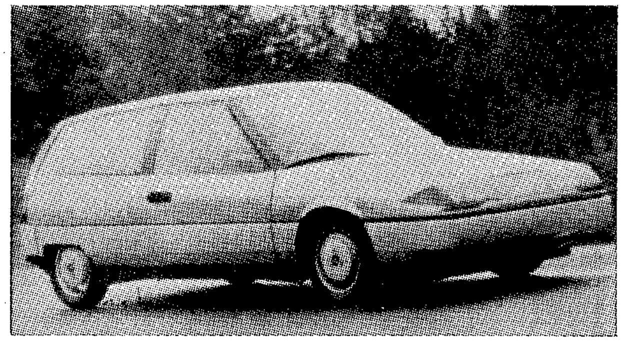


1972. Safety Car VESC--Volvo Experimental Safety Car--caused a lot of attention when it was presented in 1972.

1975. Volvo 240 became the big seller of the 1970's in Sweden. The resemblance to the VESC--e.g., the front "underbite"--is obvious.

1980. Somewhat more square was the VCC--Volvo Concept Car. The 1980's car was to look like this according to Volvo.

1982. Volvo 760 is the car that will compete with BMV and Mercedes in the status class. The "square shape" is borrowed from VCC.



1983. Volvo LCO--Light Component Project--is a possible recent sister to successful models PV 444 and PV 544.

19?? Even if design trends will call for adjustments, it is likely that the LCP will set the style for future Volvo models.

11798
CSO: 3698/91

VOLVO LCP: NEW MATERIALS, PRODUCTION METHODS

Stockholm NY TEKNIK in Swedish 20 Oct 83 pp 36-37

[Article by Ulf Bergmark]

[Text] For auto manufacturers, building cars of the future is a way of trying to control the future.

The design will probably be outmoded in the year 2000, but perhaps not the technology. The Volvo LCP (Light Component Project) was built using materials and production methods that are expected to come into use as early as the 1990's.

What will the world be like in the year 2000? That is a basic question in a technical study of the future as it relates to cars. Will there be any petroleum? Will people be able to afford cars? How strict will environmental requirements be? Is it possible to foresee what the car buyer's tastes will be?

To a great extent, auto manufacturers themselves control developments. Developing and introducing a new vehicle technology takes from 10 to 20 years.

This means that a decision concerning a car for the year 2000 must be made in the 1980's. And a decision of that kind must be based on the technical know-how that exists today. No auto manufacturer can afford to invest millions--perhaps billions--of kronor in a technology whose future prospects are uncertain, no matter how interesting it may be theoretically.

All the lightweight, streamlined, energy-efficient, and electronically controlled cars of the future now being produced by auto manufacturers therefore provide a hint as to what auto technology will be like in the year 2000.

What is hard to predict is the situation with environmental requirements. As one Volvo expert put it:

"A physician who someday discovers a new and potent cancer-producing substance in diesel exhaust might consign the diesel engine to history's scrap heap in one fell swoop."

Two-Passenger Car

It is even more difficult to predict economic and social developments. Following very extensive market studies, Volvo's project group decided to put its money on a market in which the two-car family is the norm and the number of children per family is not very large.

That explains why the Volvo LCP has only two seats. The two additional backward-facing seats are only extras, and the back seat can therefore be converted into luggage space.

Their assessment may be entirely wrong. The economic situation may turn out to be such that very few people will be able to afford two cars.

It doesn't make much difference. It was the technical solutions that cost money to develop, and the resulting technology can also be used in an entirely different kind of car.

Requirements

Here are the specifications that the group had to contend with:

Curb weight without driver: 700 kilograms. Fuel consumption: not more than 4 liters per 100 kilometers. Top speed: at least 150 kilometers per hour. Acceleration from 0 to 100 kilometers per hour in no more than 12 seconds. Frontal area: no more than 1.8 square meters. Air resistance expressed in Cd's [drag coefficient]: not more than 0.3. The car was also to have a sporty look.

Most of those requirements were met by a good margin. One exception was weight: to satisfy all safety requirements, it was necessary to increase the weight to 707 kilograms.

Engine

The development group is testing two engines, both of which are three-cylinder diesel engines of approximately 1,300 cc. One is a finished prototype from Elko in the FRG. The other was produced by Great Britain's Ricardo with Volvo's help.

The search for a possible engine for the car of the future began with a gas turbine, the reason being that Volvo owns United Turbine in Malmo, which has been working for years to develop a gas turbine for cars. But a gas turbine does not even meet today's requirements for low fuel consumption. For it to do so, there would have to be a technical breakthrough that so far is not in sight.

Fuel Consumption: 4 Liters per 100 Kilometers

In this lightweight car, both engines use less than 4 liters per 100 kilometers in mixed driving. A gas turbine takes about three times as much.

All the alternatives to a diesel engine were rejected. Either they consume too much energy or their potential for development is uncertain, an example being electricity.

One reason for the low fuel consumption is that the engines use direct fuel injection, a technology used in big truck engines.

The diesel engines in all of today's passenger cars have a small precombustion chamber into which the fuel is injected. The result is less efficient combustion. But on the other hand, today's engines do not "chatter" as much as the Volvo LCP's engines do. It is also easier to meet exhaust requirements with today's diesel engines.

Colza Oil

The West German engine lacks a water cooling system, which usually "steals" energy. Cooling is provided by the motor oil circulating around the engine. The engine is cast iron and runs well on many different fuels. One of the four experimental cars is being powered by colza oil--as is obvious from the fact that the car smells like a hot dog stand.

The British-built engine has an aluminum cylinder head and a magnesium engine block. This makes it 32 kilograms lighter, and it weighs only 98 kilograms. It is equipped with a turbocharger, and its output is a full 66 kW (88 hp), compared to the cast-iron engine's 39 KW (52 hp).

Some hard work remains to be done before the engines can be placed in production. For one thing, they need an injection system that can atomize the fuel even better so as to meet the requirements concerning particles and nitric oxides in the exhaust.

But small direct fuel-injected diesel engines will probably never be "environmentally pure" engines.

Materials

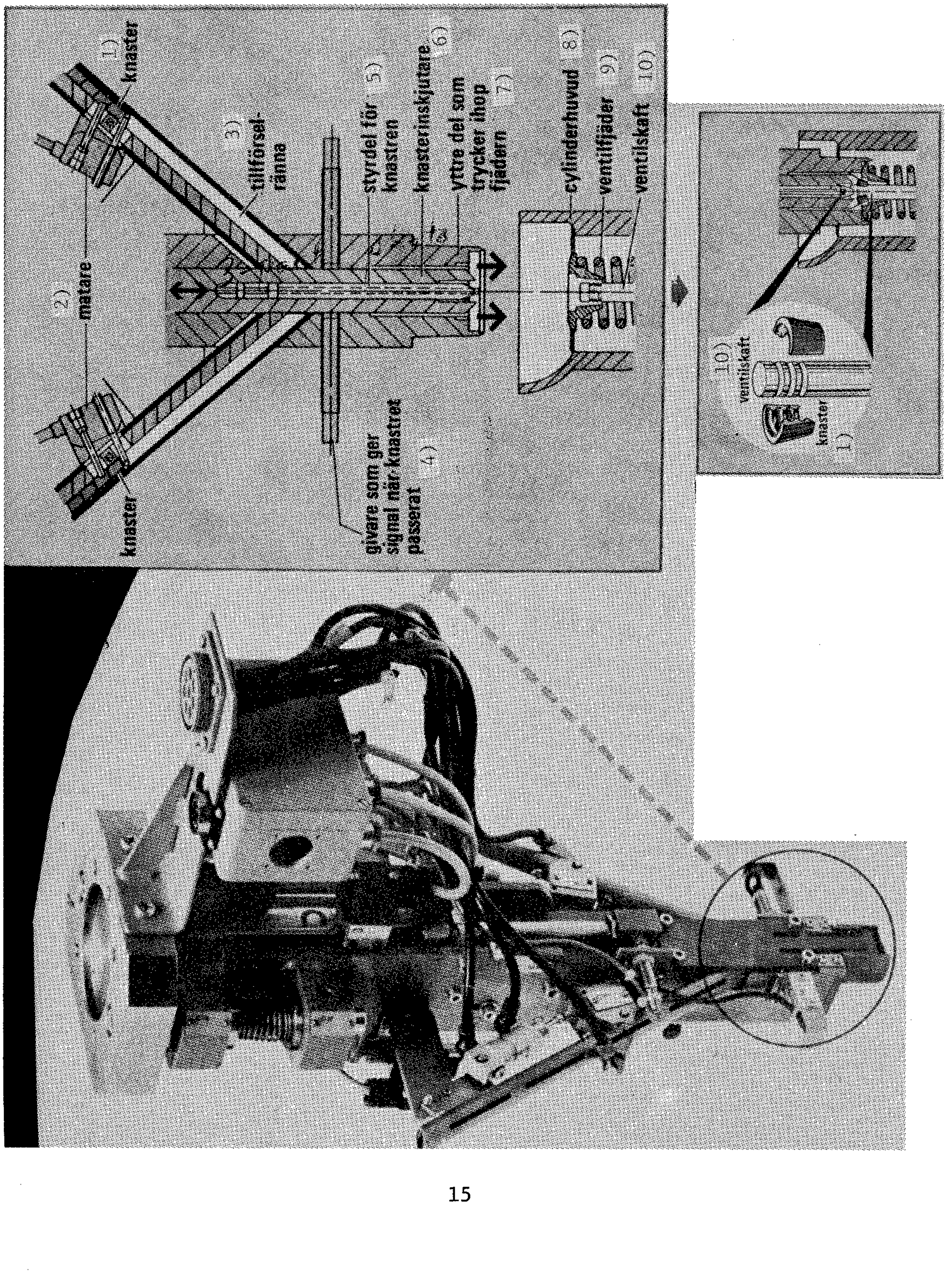
The choice of materials is guided by a complicated economic calculation. Various values regarding fuel price and weight reduction as weighed against the cost of materials and so on are included in the formula.

Rolf Mellde says: "The formula is a secret. It cost a lot of money to work it out."

A basic requirement is that weight reduction achieved at the expense of lighter and more expensive materials must pay for itself in 3 years of normal driving (15,000 kilometers per year).

So if fuel is still cheap in the year 2000, the percentage of magnesium and structural plastic used will be low.

The reason for the 3-year limit is that a new-car buyer today seldom keeps his car longer than that. A new-car buyer is not willing to pay for an "everlasting car."


knaster 1)
matare 2)
tillförsel-ränna 3)
givare som ger signal när knastret passerat 4)
styrdel för knastren 5)
knasterinskjutare 6)
yttre del som trycker ihop fjädern 7)
cylinderhuvud 8)
ventilfjäder 9)
ventilskaft 10)
knaster
10) ventilskaft
knaster 1)

Automated Birth of a Saab Engine

The engines travel through the new plant as though following a marked trail.

Manned stations alternate with automated stations where robots do the work.

The setup represents a breakthrough for automated assembly. Robots that weld and spray paint and those that inspect constitute a well-established technology with most auto manufacturers.

Automated assembly using robots is considerably more difficult, since it involves fitting together components that not only vary in size but also may be oriented somewhat differently on the conveyor belt.

Coping with those variations requires very precise positioning and many sensors to give the signal when something goes wrong. It also requires large computer capacity.

Between each two stations at Saab-Scania's engine plant is a temporary storage area. That is important if things get jammed up.

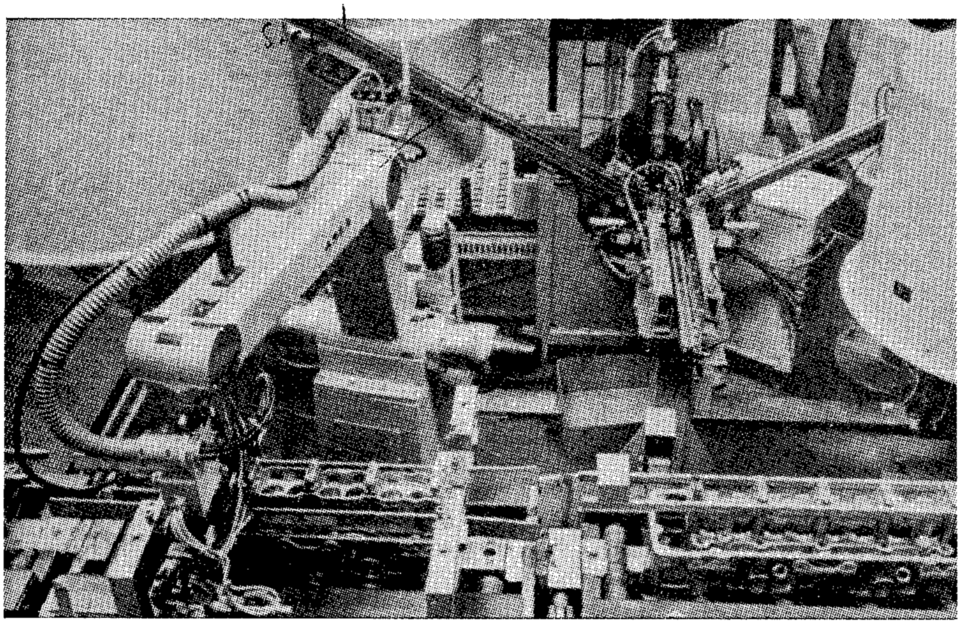
It also means that the assembly workers can work at their own pace.

The production experts will probably not be satisfied with six robots in the assembly process.

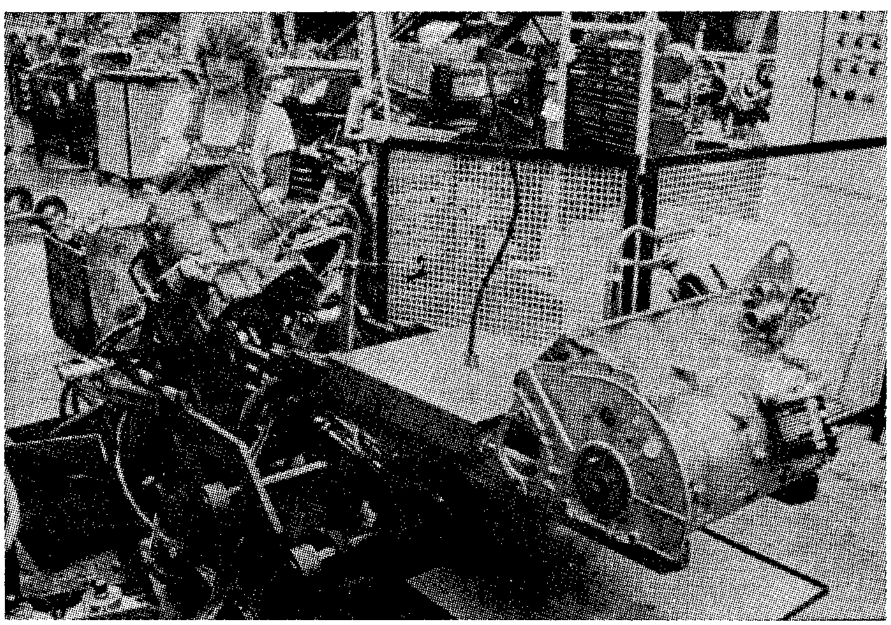
More complicated assembly jobs can be done by robots that "see" with the help of a TV camera and robots that "feel" with sensors in their grippers.

The technology for "feeling" has advanced farther than that for "seeing" and is a more likely possibility when the plant is expanded the next time.

> Step 1 [see photo on following page]: The most exciting solution is that for installing valves in cylinder heads, a time-consuming job that has been hard to automate, but automation is a necessity now that Saab is coming out with a 16-valve engine.
>
> The valves are set in place manually. This is done quickly, so there is no advantage yet to automation. After that, the cylinder heads are inverted and taken to the first robot. The robot puts the valve springs and washers in place. Vibrating and centering feeders combine two washers and one spring into an assembly that the robot can grasp with a gripper which can hold six spring assemblies.
>
> The next robot compresses the spring and places two valve keepers on it. The very small keepers (only 10 grams) hold the spring tightly against the valve. This job requires a large industrial robot, since it requires a force of 740 N (about 75 kp) to compress the spring so that the keepers will fall into place.



Step 1



Step 2

The assembling tool also measures the height of the top washer. If a keeper is seated incorrectly, the height of the washer is changed. In such a case, the cylinder head is removed from the line automatically for adjustment.

Step 2 [see photo on preceding page]: When the engine block is received from the machining department, the first items to be installed are the crankshaft, main bearings, and pistons. This is done manually on a conventional assembly line. After that, the new technology takes over.

A driverless truck distributes the engine blocks to four manual stations where gaskets, end plates, timing chain, and gear case are attached.

This part of the assembly goes quickly, and the truck arrives soundlessly to take the engine blocks away. They are set on a platform--a little trolley on which the engine rides further on the roller conveyor.

Step 3: Two robots then screw down the end plate and gear case, each of which is sitting on its short end. The first is tightened down with 13 screws of two types, the second with 10 screws of four types. The correct screws are fed to the robot automatically.

If a screw does not go in as it should, the robot presses a lever on the platform to indicate that something is wrong. If trouble occurs on three engines in succession, the line stops.

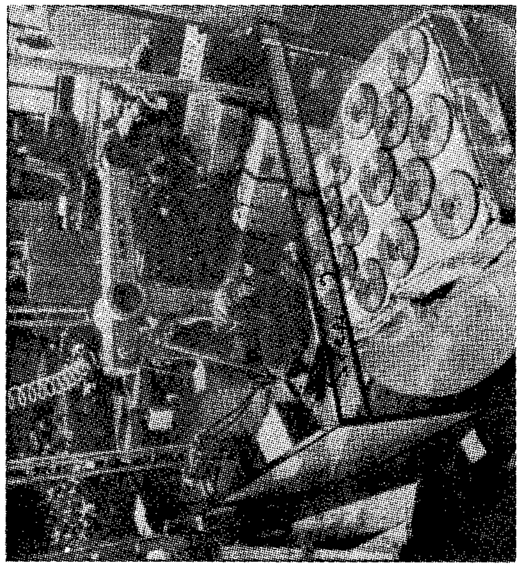
Step 4 [see photo on following page]: The cylinder heads are lifted onto the engine blocks. A robot steps in and inserts the 10 screws holding the engine together.

The screws are tightened down by a computer-controlled screwdriver. All the readings are recorded on tape, and if a screw offers resistance, the computer sounds a warning.

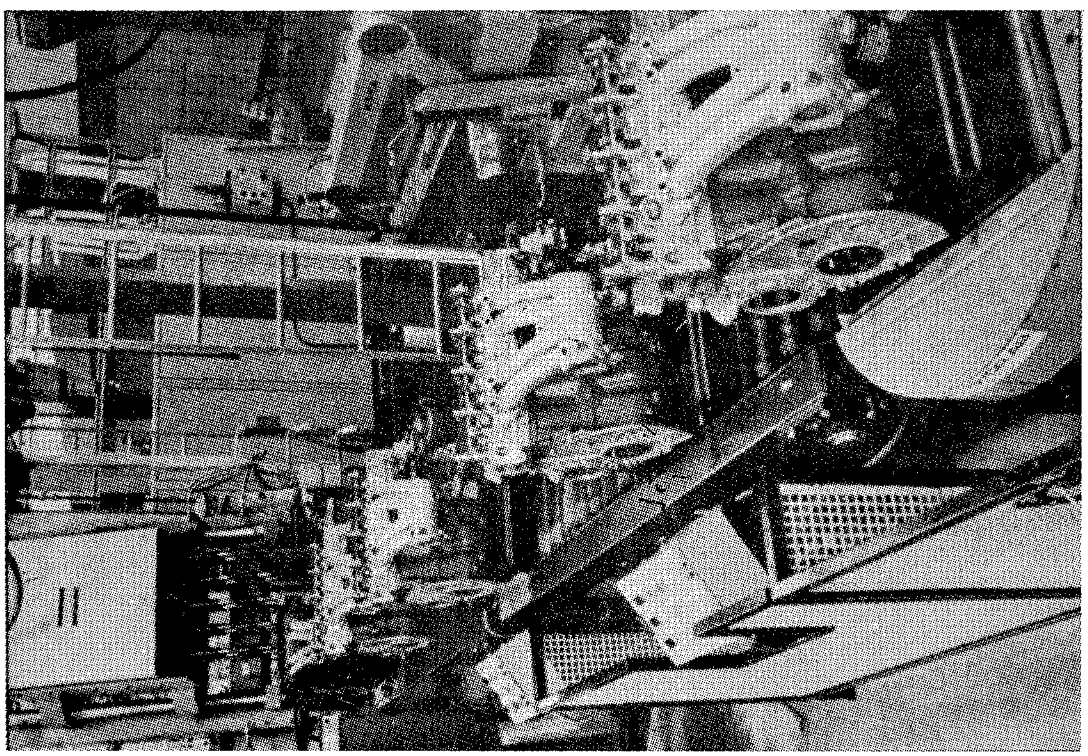
Step 5 [see photo on following page]: One of the heaviest jobs before the robots took over consisted of attaching the flywheel to the crankshaft.

Now a robot not only sets it in place but also drives in the screws.

Flywheels are delivered on pallets by a subcontractor. The robot picks out the flywheels one by one, grasps them with a three-fingered gripper, and sets them on a positioning station, where it locates the guide pin for setting the timing.



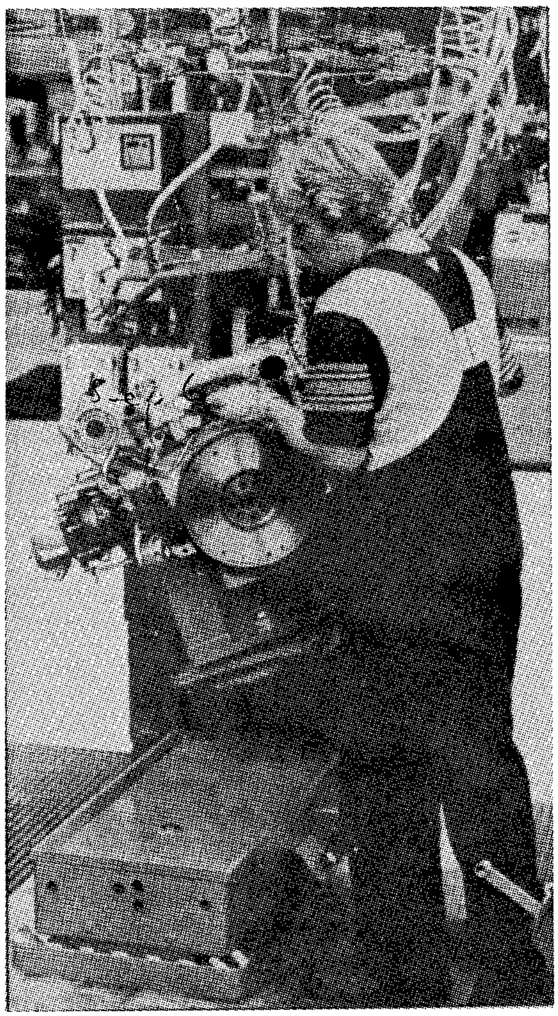
Step 5



Step 4

The robot then picks up the flywheel again and hangs it on the crankshaft.

The robot then exchanges its gripping device for a screwdriver that feeds in the right kind of screw and tightens the seven screws.



Step 6: Lastly, the engines are placed on track-controlled trolleys that pass by two work stations.

The first work station is where the fuel pump, belt pulleys, spark plugs, and valve cap are installed. The next step is to install the distributor, ignition wires, and hoses.

If it is a turboengine, it passes one more work station, where only the turbo unit is installed.

The work is done manually using screwdrivers, nut tighteners, hammers, and pliers. The engine can be raised and lowered on the trolley. It can also be rotated. This avoids uncomfortable work positions, saving backs and arms.

Scania's plant experts worked out the specifications for the trolleys in cooperation with the union and built prototypes before the purchase order was issued to Construction and Transportation Economy, the industrial truck manufacturer.

11798
CSO: 3698/91

DAIMLER-BENZ DEVELOPING ELECTRONIC 'ACTIVE SUSPENSION'

Duesseldorf VDI NACHRICHTEN in German 11 Nov 83 p 13

[Article by Th. Fuhrmann: "Active Suspension Increases Vehicle Safety"]

[Text] "Active suspension" is the automobile suspension system of the future. In this system, which is already at an advanced stage of development at Daimler-Benz, a hydraulic cylinder replaces the conventional steel spring and shock absorber and performs all the work of springing and damping. With active suspension, it is essential that this happens continuously and "in anticipation," depending on the contour of the road that is scanned ahead of the car. An electronic system processes information from sensors, such as speed, lateral acceleration and dynamic wheel loading, into the appropriate commands to the hydraulic system. Its energy consumption is about 7 kW. The speed of the sensor information to be transmitted and processed as well as stabel control when linked to all four wheels is still causing problems.

In the past the eyes of engineers and customers were directed at economical engines and aerodynamic bodywork. For a long time everything was quiet on the chassis front. The limits were defined. For years luxury-class vehicles have had independent suspension all round, with the rear wheels located by trailing links. Except for Citroen, springing and damping characteristics are determined by the shock absorber and by coil springs of varying rates. Safety and comfort, which are mutually dependent--each on a different level depending on the manufacturer--are established for the entire life of the car. With a suspension design which is now coming to maturity in the minds of those responsible for research at a few automobile manufacturers--with Daimler-Benz in the lead--this will no longer be true in the future.

What is meant is "active suspension," which will usher in a new era in automobile development, in the same way as automatic brake lock-up prevention. The epithet "active" is applied to this suspension because it will be able to determine the character of the road independently and "in anticipation" and adjust the springing and damping to it accordingly. By definition, active suspension must meet three conditions: controllability, observability and

adjustability. Another unmistakable characteristic is its energy requirement --according to statements from Daimler-Benz as much as 7 kW. A part of this energy could be reclaimed because--in contrast to a conventional system--there is no energy-consuming shock absorber and rolling resistance can be further reduced by harder tires.

While conventional suspension is activated, for example, by road surface irregularities, the active system activates itself in anticipation--it acts instead of merely reacting. The energy required flows in the form of oil into a cylinder which is mounted between the wheel's suspension system and the body. In this cylinder is a vertically moving piston, which is acted on from the top or from below by high or low oil pressure--depending on whether and how fast jounce or rebound action is to take place. The cylinder is surrounded by a second working chamber which has the function of regulating height through a separate hydraulic circuit.

These active cylinder elements are only the components that carry out the work. In order to be able to go into action they need commands, which they receive from a superior electronic system. The electronic system works out its commands based on information from sensors. The data measured are the relative distance of the body from the wheel, the relative speeds of the body and the wheel to each other and the pressure differential in the cylinder. There are also a number of external sensors which measure vehicle speed, deceleration, lateral acceleration and swaying motions and feed them to the central computing unit.

The most important of all the sensors is a component whose ultimate operation is still not clear and which will play a not inconsiderable part in the designation of "active." The reference is to one or several pieces of measuring equipment which will be mounted at the front on the vehicle's bumper and scan the contour of the road. The contour can be stored in the computer, similar to an engine ignition timing map. The information on the road contour that will pass under the vehicle's wheels milliseconds later, depending on its speed, has to be processed in microseconds by the computer and converted into control commands to the hydraulic valves.

These measuring devices are proving to be a tough nut for the development engineers to crack. Research and testing will certainly require another 5 to 10 years. Then the optimal chassis would be born.

What will active suspension offer in its developed production form? The most important gain is probably in the optimal comfort characteristics, which--unlike conventional systems--will no longer be obtained only at the expense of safety (dynamic wheel load variation). The body can be maintained at a constant level--and it does not matter how heavily the car is loaded, how fast it is accelerated, braked or how fast a corner is taken. Equal wheel loading is guaranteed. For example, the body can be lowered for high-speed highway driving to reduce wind resistance, and the system also adjusts to hard springing and stiff damping. But even at slower speeds, the system will instantly switch to "hard" if, for example, the centrifugal force sensors indicate a corner is being approached too fast. The sensors can also detect a tire that

is about to go flat. Since the vibration behavior of a tire is dependent on its air pressure, the microcomputer is immediately informed depending on frequency analysis.

Changes in dynamic wheel loading would also be automatically compensated for during braking and braking performance would be distributed equally to all four wheels. Last but not least, sensitive passengers would not have to resort to medication. The cause of motion sickness could be removed by pressing a switch to shift the eigen frequency of the bodywork up or down. There is additional enormous potential for using active suspension to improve the frequency characteristics of individual vehicle components, such as truck cabs or ambulance bodies.

So far, test stand experiments have brought "only" about a 20-percent improvement compared to the conventional system. The potential is a 50-percent increase in the area of safety and comfort, which Dr Ferdinand Panik, head of "vehicle" research at Daimler-Benz in Stuttgart, and his engineers and scientists have set as their objective. To summarize, active suspension will not only be a safety element like anti-skid braking, for example, but will also increase comfort to a degree previously unknown.

9581
CSO: 3698/138

REORGANIZATION OF GERMAN BIOTECH DEVELOPMENT SOUGHT

Duesseldorf VDI NACHRICHTEN in German 30 Sep 83 p 30

[Article by G.H. Altenmueller: "Special Centers for Biotechnology"]

[Text] An Advisory Commission of the Federal Ministry for Research and Technology has found that German biotechnological research lags considerably in important areas. It has recommended that the organizational structure of the Association for Biotechnological Research (GBF), in Braunschweig-Stoeckheim, be thoroughly reformed and that two of the three component institutes of the Institute for Biotechnology (IBT) at the Juelich nuclear research installation be combined with the GBF.

As a future-oriented science, biotechnology is extremely important for further economic development. It is also a focal point in the Federal Government's research development program. In the 1984 draft budget, DM 70 million has been allocated for such research, 11 percent more than in 1983 and almost twice as much as in 1980. The EEC's new skeletal research program will give biotechnology an outstanding place therein as a key technology. EEC member nations are accordingly expected to build research centers with special responsibilities and facilities, each in a special field (centers of excellence) and to coordinate them in a network.

The reorganized GBF could be such a center. The German Advisory Commission also recommends establishing no further major research institutions in the FRG, but rather promoting basic studies in the process of developing projects, in special areas of research and in joint research between the GBF and universities. Research and Technology Minister Riesenhuber has also placed particular emphasis on private industry being cooperatively included in the collaboration of various institutions in the field of biotechnology.

The "Advisory Commission for Publicity Supported Major Research in the Field of Biotechnology," appointed by the Federal Ministry for Research and Technology (BMFT) in February of this year, is comprised of five

university scientists and four industrial scientists; its chairman is Dr H.G. Zachau, a professor at Munich University. The report recently submitted by this commission especially criticizes the GBF's considerable lack of facilities and mainly attributes this to flawed organization, but also to changing priorities by advisory and supervisory bodies. The GBF arose from the "Association for Molecular Biology Research," which was supported by the Volkswagen Corporation Foundation from the mid-1960's, and was taken over by the Federal Government and the Land of Lower Saxony as a major research institution.

The GBF today consists of 10 institutes with a total of about 350 staff members. Its current focal points of research are biologically synthesized products of microorganisms, medically important products of animal cells, natural substances from plant cells, enzymatic transformations and enzyme technology, bioengineering and the German group of microorganisms. The groups fully meeting the commission's criteria are said to be "very much in the minority" in the GDF. According to the commission, references to application are often lacking, the results of several groups have been evaluated as below average with respect to the international standard, and apart from some laudable exceptions, interdisciplinary cooperation also leaves much to be desired.

Based on the commission's recommendations, departments and research groups should be combined into four areas in the GBF: bioengineering, enzyme technology and chemistry of natural substances, microbiology and cellular biology. Studies on plant cell cultures should not be continued, nor should the algae research at the Institute for Biotechnology (IBT) at the Juelich nuclear research installation (KFA), as it is considered isolated and problematic. On the other hand, the IBT's (with a total of 100 staff members) studies on enzymatic breakdown of polysaccharides and transformation of substances using biocatalysts are judged to be outstanding. These should both be combined with the reorganized GBF at the Braunschweig-Stoeckheim location. For the KFA, this means that it would have to give up a successful part of its diversification in nonnuclear areas of research.

The essential points of the organizational recommendations for the GBF are the strengthening of the responsibilities and decision-making authority of its management (in which scientific managers would no longer have the same rights as administrative managers) and expansion of the Supervisory Board's expertise by including at least five recognized outside scientists, who will form a "Scientific Committee." The Scientific Advisory Board, the Scientific-Technical Board and departmental boards are to be abolished.

The Advisory Commission's report is not limited to expert evaluation and recommendations regarding major biotechnological research in the FRG, but also outlines the tasks to be performed. It finds that research in the FRG is considerably lagging behind the United States, Japan, Great Britain and Switzerland in three areas. While the lag in the

field of genetic engineering is recognized and should be "mainly caught up" following implementation of current plans, the report states that the lag in development of bioreactors has only partly been recognized. There is a high percentage of foreign instruments in German institutes. Bioengineering is now to be expanded at several universities.

The commission's report also states that there is still little recognition of the lag in the search for profitable products derived from the development of new biotechnological processes. According to the report, the focus in many instances is on processes which are also being intensely developed in other countries (insulin, interferon, penicillin or aminoglycosides). The commission states: "So long as there is no success in finding multiple new processes and products developed for the first time in the FRG, a lead will not be attained."

12580
CSO: 3698/100

CIVIL AVIATION

BRIEFS

DORNIER DO 228 SALES--A Dornier 228-100 has just started a presentation tour through Africa. By the end of November the 15-seat multipurpose and feeder plane will visit 14 countries on the Dark Continent. Numerous interested parties, among them those from Togo, Cameroon, Malawi, Gabun, Somalia, Zambia, the Sudan and Djibuti, will have the opportunity to acquaint themselves with the 228, which is powered by two Garrett TPE331-5 turboprop engines, under typical operating conditions. The Dornier 228 will also participate in the Lanseria '83 Air Show in South Africa. Africa has long been a good sales market for Dornier. More than 200 aircraft of the single- and twin-engined Do 27, Do 28 and Skyservant models have been sold since 1960 in 18 countries. There are already firm orders for 14 228s, more than 10 of them from customers in Nigeria. The first aircraft was put into service at the end of 1983 by Northern Air Charter in Lagos, four other aircraft have since gone to Jambo Airlines and a private customer. Air Botswana will be the second African airline to take delivery of a 228-100 in the middle of next year. Another Scandanavian airline, Air Hudik, took delivery of a Dornier 228-100 in mid-October. This was the 16th production machine delivered to a customer. The Swedish regional airline has been operating a rented 228 on the Hudiksvall-Soederhamm-Stockholm route since 1 September. By expanding its capacity--3 smaller twin-engined planes were in service until this time--Air Hudik expects an increase in passenger volume from 11,000 to 15,000 passengers per year. [Text] [Gelsenkirchen AEROKURIER in German Nov 83 p 1207] 9581

CSO: 3698/138

ITALY'S SGS TO MAKE MINICOMPUTERS IN FRANCE

Paris MINIS ET MICROS in French 3 Oct 83 p 39

> [Text] SGS is known especially for its activities in electronics. A member of the French Components Plan, in spite of its Italian ancestry, and having a manufacturing plant at Rennes, the company now wants to manufacture Unix minicomputers in France for the Videotex market

SGS has a new look; its management has changed personnel and outlook. The present group reunites quite a few former Motorola employees, who are bringing ideas--and Unix--with them.

By doubling the number of its employees in Rennes, and consequently increasing its production space, SGS plans to produce in France the two computer models that it is presently promoting--the UX 16-20, a machine that exists here and now and which is compatible with and even similar to Onyx; and the UX 16-30, which will not be put on the market until January 1984.

The latter apparatus is a multiuser (16), multiprocessor (2 Z 8003), wholly developed in Europe at the research and development center in Geneva. Licensed by AT&T, a second source of Zilog, with an American site at Phoenix, Arizona, SGS plans to enter the computer-manufacturing market with the Videotex-related sector as its target.

The UX 16-20 and 16-30 will supposedly be assembled and tested in Rennes. The cards themselves, as well as the components, are currently being produced by SGS. A production of 20 systems per month is being considered for the initial years. These machines are to serve the international needs of the company, which is more and more interested in the Videotex market. SGS's ambition is to have its machines show up in the ranks of on-line data base vendors.

Remember that SGS's "systems" activity got started only two years ago in Italy and the US. In its turn, France has been involved in the movement since January 1983. A hundred systems have already been sold there in the last nine months. SGS does not want to reach the final user; its goal is rather the OEM [Original Equipment Manufacturer] and the ISO [International Standards Organization] market. It will entrust the maintenance of its machines to CGEE-Alsthom.

8838

CSO: 3698/160

BRIEFS

SWEDISH INTELLIGENT COMPUTER--Stockholm - "A Swedish Computer 100,000 Times Faster than the Competition's" [in boldface]--The Swedish University of Kinkoeping (strogothie) [as printed; should be Linkoeping (Ostrogothie [Oestergoetland])] introduced a new GOP (General Operating Processor) computer on 14 October in Stockholm which works 100,000 times faster than the usual large-size computer. This GOP system is an "intelligent" computer which adapts itself to different computer programs by receiving them and then translating them into its own language. The user tell the computer the objective which he wants to reach; the GOP's role is to present the method to arrive at it. This new type of computer will be usable in various branches of industry and for transmissions ordered by program. According to Professor Goesta Granlund of the Linkoeping Technological University, this GOP system is 2-5 years ahead of all other computer systems being marketed at the present time. [Text] [Paris AFP SCIENCES in French 20 Oct 83 p 35] 5586

CSO: 3698/127

CVD TECHNOLOGY MOVES FROM LAB TO INDUSTRY IN SWEDEN

Stockholm NY TEKNIK in Swedish 3 Nov 83 p 33

[Article by Fredrik Lundberg]

[Text] Linkoping--In 2 years' time, the CVD [chemical vapor deposition] group at the Linkoping Technical College has taken the step from theoretical research to commercial activity.

The group makes tools that last as much as 140 times longer than commercial tools.

About 100 tools that have been surface treated by the CVD method are being used in production by industry. One example is the mint, which since mid-October has been stamping out 5-kronor coins with superhard CVD-treated tools.

"The tools are perhaps twice as expensive, but they are much more than twice as good," says Goran Loof, who works at Tribo.

Tribo is actually a sort of "stage name" for the "CVD Group at the Technology Center of the Linkoping Technical College"--which, it must be admitted, does not roll off the tongue very easily.

Goran and his partner Torsten Rosell can indeed point to a number of dramatic results. One tool used by Assa-Stenman used to be good for 100,000 stampings. After CVD treatment, it punched out 1.8 million key blanks!

And even then, it was not the 0.007-millimeter-thick CVD coating that had worn out, but the steel under it.

A flanged mandrel at Volvo that had been CVD treated turned out to last over 140 times as long as the same untreated mandrel.

Production up Tenfold

In one case, it was possible to increase the production of extruded aluminum from 5 to 49 tons with a coated tool.

In aluminum extrusion, the chief advantage of the CVD surface is that it reduces sticking. The tool therefore lasts longer, and the striking velocity can also be increased by 30 or 40 percent due to reduced friction.

In the die casting of aluminum, it is also possible to reduce the clearance, thus ensuring a better measurement so that a hole does not have to be drilled before it is tapped.

CVD stands for chemical vapor deposition. The vapor might be titanium tetrachloride, for example, which reacts with nitrogen or methane gas at 1,000° of heat in an inert environment and deposits a coating on the surface of the tool being treated.

Different Coatings

The same method can be used to produce a coating of titanium carbide, titanium nitride, titanium carbonitride, or chromium carbide. Titanium carbide is the hardest--about three times as hard as hard metal. Titanium nitride has an extremely low tendency to stick. (It also has a beautiful gold color suitable for making imitation gold watches and jewelry, points out Torsten Rosell.)

Titanium carbonitride's qualities lie, just as one would expect, somewhere halfway between those of carbide and nitride.

Chromium carbide is very resistant to oxidation.

One of CVD's finer points is that the coating is very uniform and penetrates internal surfaces.

That is not just a boast: if a pair of screw nuts are placed on a threaded shaft and screwed together as tightly as possible, both the thread and the compressed nut surfaces are coated!

"But it is also possible to have an uncoated surface if that is what you want. In that case, you brush on a ceramic material--whose composition is secret. It is a process unique in the world," says Goran Loof.

Won't Budge

The coating is also anchored down tremendously tight, since the atoms move between the coating and the underlying steel. The result is a transitional zone several hundred atoms thick.

Chromium carbide coating also has an advantage over traditional hard chromium plating in that it is environmentally safe. The waste consists of sodium chloride and water.

We described the CVD work in Linkoping in NY TEKNIK No 21, 1981. At that time, it was still half basic research, although with obvious applications.

But now the operation has gone beyond the technical college's ordinary activities and is paying all its own costs as part of the Technology Center (see below).

It was hoped at one time that CVD coatings would make it possible to use simpler and cheaper tool steel.

But it won't work. Since the surface is so strong, it is the steel and the tool design that constitute the critical link, with the result that if anything, the requirements have become stiffer.

Minister Saw Scratches

Two damaged tools provide a clear illustration of that.

In the first case, small scores from a lathe formed an indication of fracture on a cold extrusion tool. On an uncoated tool, the scores would have worn down after a short time in use, but the hard coating of titanium carbide prevented that from happening.

Torsten Rosell says triumphantly: "The minister of industry was here in August, and he immediately pointed to the scores."

Another tool looked as though its edges were worn down. But closer study showed that the coating itself was intact and that it was therefore the underlying steel that had become deformed.

Not Just Coatings

So coatings are only a part of Tribo's activity. Tribo would like to be in on the tool design stage so that its customers can benefit fully from CVD technology.

And so far, Goran and Torsten have visited all their customers, most of whom are in Ostergotland and Smaland. About 100 CVD-coated tools are now out being used in production or tested. Some of them have wandered as far as Brazil, Canada, and India.

That is not so bad for a firm which really has not yet gotten started and which has only 2.5 permanent employees.

But it expects to have between 15 and 20 employees in a few years.

Spirit of Small Business

The spirit of small business is an honorable expression at the Linkoping Technical College.

A number of firms have already grown out of the college's research, and the Technology Center provides a way of creating the conditions for more.

The Technology Center was established as 1982 began and is a section of the college set up for fields of activity that have reached the stage of commercialization. Within the framework of the Technology Center, advanced technology is sold strictly along business lines.

So far, besides the CVD group, there are groups for PVD (another surface treating process), medical technology, transportation and transportation engineering, image processing, and surface analysis. Two other groups--for metrology and software--will soon be added.

Each area of activity must pay its own costs: salaries, equipment, premises, and so on. And they all do.

The Technology Center employs 52 people at present, most of them part time.

Turnover for the latest fiscal year was 5 million kronor. That may not seem very impressive, but politicians and businessmen in the area have great hopes for the Technology Center and the firms expected to grow out of it.

The CVD group is the part of the Technology Center that is closest to "budding," as it is called in Linkoping jargon, and by that is meant the establishment of an independent firm.

A few firms that originated in the college already exist. IMTECH, which handles image processing for the printing industry, has already racked up some successes. A new image-processing firm known as Context Vision was recently established.

Another firm that has "budded" is Microform. It has developed a CAD [computer-aided design] system that uses microcomputers.

Mats Nelson of Microform explains: "Ordinary CAD systems are interactive and cost millions.

"Instead, we have concentrated on firms that produce just a few products with many variations."

The VarKon (Variation Design) system recently made its debut at the Technical Fair, and now further work is underway with a library of various applications programs that can be called upon as subroutines by the user.

The five people working at Microform all have some connection with the college, either as students or as part-time employees.

They have their premises in the Technology Park industrial building, where parts of the Technology Center are also located.

11798
CSO: 3698/130

FRG MACHINE TOOL INDUSTRY BEGINS RECOVERY

Paris L'USINE NOUVELLE in French 3 Nov 83 pp 42-43

[Text] Outclassed by Japanese and American producers, the German machine-tool industry is reacting by fighting for lower prices and investing massively in research and development.

"We will show a profit again in 1983, after losing 2.6 million in 1982 for the first time in our history." These words from Ernest Ehmann, General Manager and Marketing Director of Hermann Traub Company in Reichenbach, near Stuttgart, reflect fairly well the situation in German machine-tool companies. Many of these companies operate with family-owned capital and are beginning to recover from the two shocks (the Japanese expansion, and the international crisis) which have removed the German giant from its first place on the world market.

Up to 7 percent of the gross income dedicated to research

With a gross income of 3.46 million dollars, Germany today is the third world producer behind Japan (3,89 billion dollars), which has just overtaken the United States (3.62 billion dollars). This situation is considered an insult on the other side of the Rhine.

This traditional industry, which employs 100,000 workers and is at the core of the German mechanical industry, was not in a position to sit still without reacting; first by stopping the Japanese invasion on its own market. In 1982, the Japanese portion of the German market fell from 3.9 to 3.1 percent. "This result is the direct consequence of our research and development effort, undertaken to pick-up the Japanese challenge" points out the Verein Deutscher Werkzeugmaschinenfabriken (VDW), the German syndicate of machine-tool manufacturers. Moreover, West German companies have been successful in maintaining a high level of export: 2.3 billion dollars, or 65 percent of the total industry income.

Faced with this crisis situation, German leaders have selected two types of strategies. The first is a pricing strategy which consists in fighting on the market for mass produced machines by achieving savings on quantities. It is this difficult road which has just been adopted by Gildemeister, the largest German lathes manufacturer, by picking up 75 percent of the capital

of Pittler Company. Supported by banks the two companies, which have been losing money for the last several years, are hoping to correct the situation next year by standardizing their products.

The other, and less traumatizing, strategy which consists in occupying, or even creating a narrowly defined market by keeping a position on the leading edge of technology is, it seems, favored by German leaders who have rushed into it by investing massively in research and development. 3 to 4 percent of the yearly income on the average (with peaks of up to 7 percent), have been invested in the development of new products. This has allowed many companies such as Deckel, Index, Maho, Muller-Weingarten, Traub, and Trumpf, to weather the crisis without too many problems. There are even real stars like Trumpf, in Ditzingen, (sheet-metal stamping and laser-cutting machines) which has succeeded in increasing its revenue from 70,000 Deutsche Marks in 1973, to 180,000 DM in 1982. Similarly Maho Company in Pfronten (milling machines and machining centers), succeeded in increasing its revenue from 80 million DM in 1976/1977 to 200 million in 1982/1983. The firm invested 40 million DM in three years and is planning to invest 15 million next year.

Fighting even on Japanese strong points

Compared with these champions, Traub's evolution is less spectacular. The continued increase in revenue, which reached 140 million Marks in 1981, was stopped in 1982 (135 million), an amount which is expected to be maintained in 1983. But the evolution of the Reichenbach company is nevertheless interesting. First because the company's market is in lathes, where the Japanese have concentrated their effort. Comfortably settled for several years in the production of cam-operated lathes, the German manufacturer was surprised, as were many others, by the arrival of Japanese numerical control equipment.

The second problem, the international recession, has hit the company, which used to export 75 percent of its production, very hard. Solidly settled on the Brazilian market with a factory in Sao Paulo, it saw its South American market collapse. As Ernest Ehmann indicates: "Faced with a general decline, we had to organize a strategic withdrawal upon our national market; a complete structural reversal which resulted in the export proportion of our revenue going from 75 to 35 percent."

During this period, Traub had to fight hard to find its place in the numerical control lathes market, where the company was breaking in late. Its success can be explained by the deliberate decision to canvass companies which had not yet made the jump to numerical control and offering a more "technical" solution: the GPS system (Grafische Prozesse Simulation), developed jointly with the Fraunhofer Institute in Berlin. The GPD system provides a graphic simulation of the machining cycles. This success was strengthened by other innovations such as the automatic computation of the tool length (ATC) and the development of an automatic rod loader with mechanical guiding which allows high speed and vibration-free processing. "A rod-loader which is truly designed for numerical control and explains the success of this equipment" stated Wolfgang von Zeppelin, Director of Research and Development.

This is the material result of heavy production investments (5 million DM per year) and R & D investments (6 million DM per year in the last three years, or 4.5 percent of the revenue). The most recent product of this effort is the development of flexible turning cells (20 units have already been sold, 6 of them in France, at 1.3 million francs apiece).

In itself, the penetration of the French market is quite an achievement. In a completely depressed market, Traub-France saw its revenue increase from 28 million francs in 1981, to 48 million francs in 1982, and it is expected to reach 58 million francs in 1983. "A result which is the consequence of an enormous sales effort" explains Nicolas Priore, General Manager of Traub-France "we have maintained our position on the mechanical-lathes market, and we have progressed on the numerical-control lathes market".

6445
CSO: 3698/144

REVIEW OF PRESENT ACTIVITIES, FUTURE PLANS OF MHS

Financial Situation, Plans

Paris ELECTRONIQUE ACTUALITES in French 4 Nov 83 pp 1, 30

[Article by JP Della Mussia]

[Text] Nantes--Change of direction, reorganization, turnover increased by 80 percent. All is not quiet currently at the Matra Harris Semiconducteurs integrated circuit plant in Nantes.

This situation is actually the combination of two factors. On one hand, a satisfactory situation for the intermediate future: the plant's production goals have been achieved, and its 1983 revenues are getting to be twice those of 1982 thanks to the present price increases for circuits and to its larger production capabilities; MHS should thus experience no further losses starting with the third quarter of 1984. On the other hand, the long term situation does create, if not worry, at least concern, since MHS has to undertake investments that are enormous for its size in order to remain in the technologic race, without knowing what the prices for its circuits will be beyond 1985. The shareholders, Harris and Matra must establish before the end of the year, the extent of the investments to be financed in 1984. MHS is thus at a turning point in its history.

The Change

Mr Dumas, former director of Fairchild Europe, was named full-time president of MHS last July (up to then this position was filled part-time by Mr Fougere, from Matra's components branch). In mid-November, Mr Lassus, director general of MHS, resigned, along with Mr Cornet, who directed Cimatel, a joint subsidiary with Intel.

No official version of the events was given. Our own investigation however, has led us to piece together the explanation that Harris would have been the one who asked that a full-time president be named for MHS. Although it has achieved its planned production goals, MHS supposedly was not in perfect agreement with Harris about the technologic approaches it should use, seeking

in particular a certain freedom which is unfortunately costly under the present circumstances. In fact, relations between Harris and MHS are supposed to have improved since the arrival of Dumas, as indeed, they have improved with Intel.

The departure of Lassus came as a surprise. Relations with Dumas were good, each one's know-how being rather complementary (Lassus is much closer to the technology than Dumas). Nevertheless, Lassus must have felt superseded in some of his management functions. Moreover, since the personalities of the two men are very different, Lassus preferred to leave (to direct Thomson's MOS activity). Today, everyone at MHS regrets his departure: Lassus put together the plant and its teams from scratch, and that counts for something. Cornet's departure appears to be totally independent: he simply seems to have wanted to go to the United States for personal reasons.

140 Million Francs Turnover in 1983

Until now, MHS has been pursuing fixed objectives in production. This year unfortunately, it will not achieve its planned profitability: the market price of most of the circuits manufactured by MHS have slipped during the past two years under Japanese pressure, and MHS has had to follow suit (some of the prices are four times lower than planned). This year, the company's revenues (including the sales of Harris products) should nevertheless reach 140 MF (million francs) against 84 MF in 1982, due to larger production capabilities, but especially to higher prices. At the beginning of 1983, the Nantes plant produced more than 50 percent of the MHS revenues, a figure that will reach 55 percent for 1983 as a whole. In 1984, it should exceed 75 percent.

If everything proceeds as expected, profitability should thus be achieved during the third quarter of 1984.

The 1984 Plan

The pressure on prices and the resulting losses have undoubtedly weighed heavily on this year's investments. None of the wafer steppers in Nantes are working on mass production, and an introduction date for 64K C-MOS RAMs is no longer being given. In addition, projects have been dropped following government decisions or poor circumstances in France: the failure to introduce the T 83 telephone set, for instance, has stopped the project to produce the NEC 4-bit microprocessor.

The fact that these projects have been dropped should not be considered as negative, at least not for MHS and for the short term: the plant's production lines are working at their full currently available capacities, and from the profitability standpoint it is better to manufacture only a few products, preferrably from among the circuits whose return per silicon wafer is highest (this revenue depends on the circuit market price, chip area, and production yield).

For 1984, three priorities are now assigned for production: static memories (among which the 16K), microcontrollers (among which the 8051/31), and gate arrays.

The distribution of the plant's turnover should be 40 percent for memories, 30 percent for gate arrays, 25 percent for the microcontroller, and 5 percent for telecom circuits.

For 1984, there are also plans to double production capacity in terms of wafers/week, this action being carried out in parallel with a plan to increase yield by 50 percent. This plan will be supported by a quality improvement project.

For new developments, the plan depends on MHS's partners, namely Harris for C-MOS technology, and Intel for circuits. The range of memories should thus be expanded, as will that of microprocessors (80C51, 80C86, and 80C88 in particular). Moreover, MHS plans to implement the SAJI V technology (2 microns) in 1984, and to introduce double metallization. The gate arrays will be developed partially around the national programs. Lastly, Cimatel's activity, in agreement with Harris and Intel, will be focused solely on C-MOS-technology telecommunication circuits (until now, Cimatel designed only with N-MOS).

For the time being, plans for developing a bipolar activity are cancelled. This decision could be revised only if the market for Harris' bipolar SLIC devices with dielectric insulation were to expand to the point where it would become interesting to fabricate them in France.

The MHS Case

As we have said, all of the company's future will depend on the investments that it will make in 1984. The least that it can achieve is the installation of a 2 micron C-MOS line, and that investment is planned. A 2 micron line costs about 150 MF, which is equal to the 1983 turnover (this is not an MHS figure, but our estimate). Actually, a 2 micron C-MOS line would have already been installed this year if MHS had wanted to place itself in a leading technologic position at the end of 1983.

In 1984, a 1.6 micron technology should thus be implemented, a line whose cost is probably of the order of 200 MF. This race could appear futile, on one hand because of the current market price for circuits, and on the other for a so-called niche company. Unfortunately, the race is essential for growth.

Under the present circumstances, with the price of memories having risen to the level at which companies in principle no longer lose money, a 3 micron technology seems to be sufficient: it makes it possible to manufacture at a certain profit, memories that are not, or are only moderately advanced, and which are in great demand. But what will happen at the next crisis? Prices will plummet for products whose technology is mastered by all manufacturers, and will resist only for advanced products. Woe to him who is not among the leaders.

Moreover, MHS cannot be considered as a true niche company, whose circuit prices are protected either by their original technology or by their original operation.

No memory, very few telecom circuits, and no microcontroller is being manufactured by MHS exclusively. Only the gate arrays and some programmed microcontrollers are actually specifically MHS (about 40 percent of the 1984 revenues), and thus enjoy a relative protection against market price fluctuations. As part of the overall goal of the company, we think that the ideal would be for one-third of its activity to eventually be devoted to C-MOS memories and standard microprocessors in order to polish its technologies, one-third to preprogrammed or programmable circuits with the same technology, and the last third to innovative circuits integrating the know-how of French systems companies with polished technologies. Market price fluctuations would thus affect only one-third of the company's revenues, and the innovation task assigned to MHS would be respected. We should point out here the great opportunity for the company's development: it can simultaneously benefit from Harris' advanced C-MOS technologies, and from Intel's microprocessor know-how. This transfer of know-how is not free, but is far less costly than in-house research.

Competent teams, innovative promising markdets for the new circuits, sources of advanced technologies, and investment means that do not depend on goal fluctuations or shareholder resources, are unfortunately not enough for success: you have to know how to sell throughout the world, and exportation amounts to only 40 percent of the company's plant revenue, a percentage that is too low. It should be pointed out, however, that it depends heavily on Harris in the United States, and on a Harris-MHA network in Europe, two-thirds of whose revenues come from Harris products. It is certainly not easy to promote MHS foreign sales under these circumstances.

Technical Innovations

Paris ELECTRONIQUE ACTUALITES in French 4 Nov 83 p 29

[Article by JPDM]

[Text] MHS has just added a 250-gate version to its 400-800/1200 gate arrays, a version which among other things proves to be very well adapted to the integration of 2 or 3 PAL or FPLA's. The cost of a study to transfer a programmed circuit to a gate array is low, since MHS has software which starting with a Boolean equation, directly produces a logical layout that can be automatically implanted by MHS on the gate array.

For an investment of less than 100,000 francs, it is thus possible to obtain without in-house study by the customer, a unique economical circuit named HAL (hard-array logic), which should be of particular interest in the automation field. We might add that HAL is to PAL and PFLA, what ROM is to PROM.

But HAL is not the only MHS novelty in gate arrays.

The autonomous development tool announced by the company last year is now available for $65,000. Moreover, service companies are beginning to offer the company's gate arrays.

An Autonomous Development Tool

We might remember that MHS began to manufacture gate arrays in August 1981, starting with a 3 micron MOS technology and one level of metallization, by developping a CAD (computer-aided design) technique adapted to standard cells, and by asking Matra Design Systems in the United States to study new software. The first 1200 gate/30 MHz circuit was created in 1982, and sales of gate arrays outside the group started in December 1982. Since then, MHS has undertaken five custom designs per month. The circuit in greatest demand is the 400 gate device. Contrary to all expectations, production lots often reach several hundred thousands parts per project, due to increasingly shorter equipment lifetimes, which can no longer wait the minimum of nine months required for made-to-order circuits, especially in minicomputers.

Production of the circuits designed during the preceding months began in June 1983. Support for development expanded in November 1983. As we have said, the autonomous development tool designed by Matra in the United States is now available (ELECTRONIQUE ACTUALITES of 26 November 1982). Its utilization is profitable for all companies that have to customize more than 3-5 gate arrays per year. At the beginning of December, MHS will be in a position to transfer to users which already have a computer, all the technical data of its gate arrays and the accompanying cell library (80 circuits). MHS can also transfer its software, but nothing prevents users from using their own.

5000 Gates in 1984

Design centers are finally opening up. Some, such as the ones in Nantes, Munich (opened on 1 September), Matra Design Systems in the United States, and Paris (first quarter of 1984), belong to MHS. The others are those of approved service companies: Systemes Sud (Toulouse), Mikron (Germany), and Elektronik Centrale (Denmark in the near future). Since 1982, MHS has also been improving its software, in particular for self routing.

During 1984, MHS will expand its network in France and abroad, but the great novelty will be the introduction of the 2 micron SAJI V technology and of two-level metallization (four masks per custom design), which will make it possible to offer circuits with 2500 and 5000 gates. Samples of these circuits should be available by the third quarter of 1984, with all the attendant services. Production is planned for the end of 1984. The 5000-gate model, with an area of 50 sq-mm, should allow the fabrication of circuits with as many as 150 pins.

An additional step will be taken in 1985 with the issue of standard cells whose basic library will be the same as that of the gate arrays (to also include RAMs, ROMs, and eventually, a microprocessor). Actually, this standard cell concept will be more powerful than the current one, because the user will be able to form his own library from circuit nuclei designated as primitive, or from basic elements of registers or counters (bitslice cell). Macro functions could then be automatally generated by users, at which time there will exist a concept of function hierarchy.

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SGS'S NEW CATANIA PLANT: ADVANCED TECHNOLOGIES, AUTOMATION

Paris L'USINE NOUVELLE in French 3 Nov 83 p 91

> [Text] SGS has just presented its new Catinia plant: a technological peak in power components manufacturing. Its spearhead: the most highly automatized production line for transistors in the world.

Forty million dollars. Such is the amount of the investments made by SGS, the first electronics company in Italy, between 1980 and 1983. The objective was simple: to turn a low technological level components assembly plant into the world's most advanced plant for the production of discreet components and standard logic families integrating all steps in the process (crystal growth, diffusion, assembly, and test). SGS is therefore about to occupy one of the first positions on the international scene.

At the root of this success are, first of all, SGS's original processes and patents. Thus, in order to protect the junctions during the fabrication of Mesa technology transistors, SGS has developed a glass deposition process which provides passivation. The silicon wafer is placed on a 100 micron layer of glass powder which is then melted (electrochemical process). In addition, this glass protection provides a higher rigidity, and consequently, a higher resistance to deformation.

The fastest Crystal-Growing Process in the World:

SGS has also developed an original process, called Mesa Multi-Epitaxial, for the production of high voltage transistors capable of carrying up to 80 Amp overloads.

But SGS' main strength lies in its equipment. The Italian company has developed its own crystal-growing ovens which are the fastest in the world. For the diffusion process, the Catania plant has a total available area of almost 4000 square meters (the largest in Europe), with class 10 clean rooms of the type commonly used for the production of integrated circuits, but never for power components. SGS is expected to start production in the near future, of five inch silicon wafers (the current standard is four inches). The production capability will reach 9,000 wafers per week.

SGS also has the world's most automatic production line for the manufacture of TO3 power transistors. Soldering of the connections is accomplished automatically using a programmable robot, after learning and memorizing the geometry of the semi-conductor using a Sanyo video monitor which then recognizes, for each unit, the different points to be connected. The soldering robot was produced by Orthodyne Electronics. The remainder of the operations (plating, freon cleaning, automatic testing, and laser marking according to the tests and the 14 different types of products) is accomplished without human intervention. Defective components are directly rejected if the test result is negative. Automatization of the production of discreet components has provided a 45 percent gain in the production cost between 1980 and 1983. In the same period, the rejection rate has dropped by a factor of three, and SGS is hoping to be able to lower it even more in the coming years by improving the transistor geometry.

The Catania plant would not be complete without its own research and development center equipped with advanced tooling (Calma stations) and equipment among the most advanced such as the Canon MPA 500 FA projection mask aligner with a 1.5 micron line opening tolerance, on the market for the last few months, and in the process of evaluation by SGS for its new five-inch wafer production line.

More Advantageous than Bipolars

The technology research capability available to SGS enables the company to be a leader in MOS technology power components (or power MOS), integrating all secondary circuits within the same module can. These modules will challenge the transistor market in the coming years (they operate at up to 400 volts), particularly for low voltage applications where they are more advantageous than the bipolar circuits.

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MICROELECTRONICS

BRIEFS

SWEDISH MICROELECTRONICS PROGRAM--Stockholm - "Sweden Is Going to Devote 714 Million Kronor to a Microelectronics Program" [in boldface]--Swedish industry and government are going to give, jointly, 714 Sk (the same number of French francs) to the development of a 5-year microelectronics program in Sweden, we learned from a reliable source in Stockholm on 24 October. The government already intends to include the sum of 44 million SK as an item in this year's budget. This large-scale 5-year program will center around four axes: training, basic research, applied research, and industrial development, which will itself absorb 330 of the 714 Sk projected and in which the Swedish Firms ASEA [Swedish General Electric Corporation] and Ericsson will participate, according to the same source. [Text] [Paris AFP SCIENCES in French 27 Oct 83 p 35] 5586

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FRG INVESTMENT CONGRESS DISCUSSES VENTURE FINANCING

Duesseldorf VDI NACHRICHTEN in German 11 Nov 83 p 26

[Article entitled: "Capital for New Ideas and Technologies"]

[Text] An industrial country like the FRG will probably be able to survive in the competitive struggle with American and Japanese challengers only if traditional, ossified structures and procedures are repeatedly broken down and young new technologies and enterprises are supported. And in particular this means investing in creative people and ideas. However, at the "Munich Innovation Congresses" attention was also called to the problems as well as to the opportunities associated with venture capital.

The focal point of the "Munich Innovation Congresses" at the Sheraton Convention Center in Munich was the question of how, specifically, it would be possible to divert flows of capital into promising innovative projects, such a move being clearly desirable in principle. Sponsored by the "IC Investment Congress Ltd", Munich, there were simultaneously one congress on venture capital financing and one on so-called "franchise" undertakings, both accompanied by a large number of extra events which were extremely helpful in making contacts.

In his welcoming speech Bavarian Minister of Finance Max Streibl said that "after having obtained in the past few years a clear idea in individual countries about the new technological possibilities and the resultant requirements for economic restructuring, we will also have to concern ourselves intensively in the future with the socio-political consequences. There is no doubt that the innovative technologies will be accompanied by changes relating to fiscal, labor-market and structural policies.

Venture Financing in Motion

Of course, in the present phase the actors in this young sector appear to have their eye less on the later consequences than on the opportunities of the moment. Dr Rudolf Sprung, parliamentary state secretary in the Federal Ministry of Finance, confirmed that the developments "are just beginning, but there is now movement on the scene. This atmosphere of starting out can only be evaluated as positive; we need it." But unfortunately Sprung also had to dampen many a possibly too euphoric expectation of the congress

participants; the government in Bonn is, of course, very interested in how the venture capital idea could be made useful for our country, "but there are reservations in respect to tax support for venture capital projects and enterprises. Therefore, please entertain no illusions in the tax sector."

Axel Schmidtke, managing partner of IC Investment Congress Ltd, referred to the necessity of also developing innovative instruments to support and finance innovative organizing companies and to strike out in new directions. This addressed not least "the initiators of the tax saving market who now urgently need new fields of action." In fact, according to Schmidtke's presentation, substantial opportunities are opening up in this area, young enterprises in the United States, for example, are often first established within a circle of friends with each one paying in about 10 to 50 cents per share. If it is successful, then venture consortia participate, but now at a level of perhaps $3 per share; and finally in the "disinvestment" phase the enterprise is put on the stock market--but now at prices between $9 and $18 per share. Thus, a successful start of a company is a definitely rewarding affair.

Wherever it is possible to do well, that is where the sharks also like to be very active. At the Munich congress Dr Hermann Burgard of the EC Commission (he is director of "Innovation Policy and New Technologies") gave not only a detailed description of European activities in the field of venture financing--for example, support in establishing national second markets for trade with venture shares--he also expressed a clear warning; "I warn you of the fact that when one sees nothing but mushrooms, one fails to allow for the presence of toadstools among them." It might well soon be necessary to develop a special code of behavior for this new field of activity.

The breadth and depth of information which was offered here at the two and one-half congresses in Munich cannot be even approximately reproduced here. In short overviews, for example, the relevant science in America, Japan and other important countries was presented and a number of additional talks demonstrated which particularly innovation-rich areas should be watched with attention. These include automation and robot technology, laser technology, pharmacy and biotechnology, genetic engineering, and not least also general medical technology.

Lack of Good Projects

Yet no matter how broad the palette of activities which promise success-in practice, as was shown in another lecture, it does not appear to be so easy to put readily available venture capital into "good" projects. For as Karl-Heinz Fanselow, business manager of the German Venture Financing Society (WFG), said: "There is no shortage of money, only of good projects and managers." According to Fanselow, every year the WFG receives about 170 inquiries, "yet the WFG makes partnership agreements with only about 10 percent of those companies which make inquiries in anyone year. With most of the other companies there is a lack of relevant market ideas."

Those are words which give pause. For even if the WFG should often act more cautiously than indicated--as frequently asserted by critics--there must apparently still be substantial improvement in the management qualifications of many hopeful inventors, innovators and organizers of companies if in good conscience equity capital is to be entrusted to them. And meanwhile that is what a large number of hopeful venture capital negotiators want.

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PROS, CONS OF VENTURE CAPITAL IN FRANCE

Paris ELECTRONIQUE ACTUALITES in French 18 Nov 83 p 42

[Article by Olivier Picon: "Mutual Venture Investment Funds: A Financial Panacea for Young Firms in Advanced Technology Sectors?"]

[Text] Mutual venture investment funds are now authorized in France. Their creation is part of the large movement that has emerged in our country around issues of investment in medium-size companies that need capital and should gain access to the public's savings.

We have become aware of this as a result of recession and unemployment. Public opinion has understood that today jobs can no longer be created by large companies, but rather by small and medium-size enterprises. This teeming of new ideas is contrary to an entire French tradition dating back to Colbert and putting its trust solely in the "welfare state." It is so strong that it has survived the political change of May 1981. After marking time for a while, the march forward soon resumed.

What is involved is a rehabilitation of savings and a willingness to assume the risk of investing them in enterprises. The major milestones of this evolution were the Monory law and its sequels, the Delors-stock savings accounts that gave tax deductions to stock buyers, the creation of a second stock exchange market, to a lesser extent the CODEVI [Industrial Development Accounts] and finally the mutual venture investment funds defined in the law of 3 January 1983 and the decree of 2 May.

To a greater extent than previous reforms, the creation of mutual venture investment funds is aimed at young and expanding high-technology companies. In other words, electronics and its many avatars--data-processing, office automation, robotics--should provide the bulk of companies into which these funds will invest.

To understand mutual venture funds, we should first recall the definition of the traditional mutual investment funds. These are jointly owned securities (stocks and bonds). From a purely financial point of view, it is as if fund shareholders owned the stocks or bonds directly, especially because of the limpidity of the tax situation.

Mutual Investment Funds: The Right Size for Good Investments

Their principle is very close to that of the SICAV (Variable-Capital Investment Companies). The major difference has to do with their respective sizes. A SICAV can concentrate a huge and unlimited capital. The starting assets of a mutual investment fund cannot exceed 100 million francs.

The size of mutual funds is ideal for security investments. It provides sufficient capital for each investment while diversifying the assets, something a private person can hardly hope to do. But the mass achieved remains rather modest so as not to lead to paralysis, for the handling of excessive capital cannot fail to have an impact on stock exchange prices and, in the case of unlisted stock, would lead to a scattering of the funds invested over an excessive number of companies or to excessive influence in the companies selected.

The mutual venture investment fund differs by its objective, which is to acquire an interest in companies that are not listed on the stock exchange, i.e. therefore in medium-size and usually young companies. The fund is required to devote at least 40 percent of its investments to unlisted companies; this is to prevent funds from betraying their calling in favor of companies already established on the stock exchange.

A Long-Term Commitment

An essential point, we believe, is the length of the commitment made by shareholders of mutual venture investment funds. Whereas the shareholder of an ordinary fund can at any time have his shares bought back by the fund at their current value, the saver joining a venture fund must commit his capital for at least three years. In certain funds, his capital may even be locked in for 10 years. There is only one way out: selling to a third party.

"Fickle" shareholders looking for fast capital gains should therefore stay away from these new institutions. Those who join must show both spirit of enterprise and a sense of industry, in other words they will have to be daring and patient.

True Associates

The corollary for the companies is the certainty that they will have to do with true associates who will share their concerns, and not to financiers eager to turn a profit on their investments.

Another difference with the traditional mutual investment funds: because of the risk involved in investing in unlisted companies, the fund managers are required to make a larger commitment. If the fund is open to the public, the managers must own at least 10 percent of the shares (1 percent only if the fund is intended only for artificial persons). Since the "follow up" work is more difficult and time-consuming, the remuneration of the managers may be higher. In addition to the purchase and sales commissions (4 percent maximum) and management fees (2 to 3 percent per year), the by-laws of certain funds provide that the managers may receive up to 20 percent of the balance in hand after the fund liquidation.

To make up for the risk and constraints involved in these funds, some would like them to be given special tax benefits. It was hoped these would be included in the draft budget. Apparently, that will have to wait. But pending a special tax status, potential initiatives are being held back. Actually, mention has been made of a special tax status for capital gains, an income-tax or wealth-tax deduction, and even an early repayment of the imposed public loan.

Mutual venture investment funds are obviously attractive for subscribers. Who has not dreamt of having been an initial shareholder of IBM, Schlumberger, Apple, Intertechnique or SAGEM [Company for General Applications of Electricity and Mechanics]. To achieve such a performance is reason enough to take risks and be patient. And if we mentioned Apple, it is because a U.S. investment fund was actually involved from the start of the company.

Actually, the main question is to know whether mutual venture investment funds will play the part assigned to them for the companies that need them.

The American Example

Although it can hardly be transposed, the American example shows what venture funds can do for companies and for the economy. In the United States, "venture capital" funds have drained over 7 billion dollars and contributed to the financing of 3,500 companies, almost all of which are involved in high-technology sectors. As for the shareholders, they have won by a large margin: on the average, their investments increased tenfold in 10 years, which corresponds to a yield of 27 percent per year.

French Obstacles

Unlike the United States, France is not a breeding ground for ventures. Moreover, many obstacles hinder those who want to follow a dynamic investment policy.

- The mentality of the average French saver. He is often more interested in an assured yield than in a potential capital gain if achieving the latter involves the risk of a total loss.

- The mentality of the banks. Most of them prefer the status of lenders, which assures them of regular returns, to that of shareholders, which does not pay as much in the short run and is less comfortable. And if they do get involved in ventures that they believe are excellent, they tend to keep the stock all to themselves rather than sharing it with other investors.

- The mentality of entrepreneurs themselves, who are jealous of their independence and do not like the idea of being accountable to outside shareholders. The only company owners likely to turn to mutual venture investment funds are those with an "American mentality" or those who cannot meet their companies' capital needs. Their number will increase only when these funds have been tried and tested.

- The French economic fabric is not conducive to the creation of high-performance independent companies. Many promising enterprises belong to large industrial or financial groups or were acquired by such groups, which then jealously kept them or stifled them.

Now, the individuals and organizations qualified to become managers of mutual venture investment funds are essentially banks--fortunately, there are dynamic banks--and also, and encouraging fact, other financial go-betweens such as stockbrokers.

Giving Cadres the Means to Create

The essential quality of a manager shall of course be the ability to prospect for companies that truly have a future and to achieve a profitable alliance with the company's head. An excellent idea has emerged. The company head who opens his capital to a mutual investment fund also becomes a shareholder in that fund, which enables him to diversify his assets and at the same time leads to a relation of shared interest as well as to better understanding. Meetings between mutual investment fund shareholders and company managers are also contemplated.

The banks have the advantage of knowing the companies; others will have to approach them by becoming to a certain extent familiar with the industry or by prospecting in industrial circles.

One of the avowed objectives of the creation of venture funds is to provide cadres with the financial means to create their own companies or, in extreme cases, to spin off a small division from a large company and turn it into an independent business managed by its cadres. Will the engineers and managers of the French electronics sector then succeed in swarming off as their U.S. colleagues so readily do, precisely with the frequent help of mutual venture investment funds?

Not To Betray the Original Calling

This should be possible if the spirit of these funds is not diverted. We may fear that some will often select companies that have reached a certain maturity, whose growth is not completed but does not offer much risk anymore, and that they will try to achieve fast capital gains by having these companies listed on the stock exchange as soon as possible, on the second market which was designed to list medium-size companies.

Many funds may also choose not to exceed the required minimum of 40 percent of unlisted companies and devote the balance of their assets to traditional investments. One fund already announced its intention of acquiring many bonds to ensure that its shareholders will receive a certain yield. In our opinion, this is a total misunderstanding of the very notion of mutual venture investment funds. A better idea would be to complement investments in French companies by investments in U.S. venture companies, as certain funds are planning to do.

All the same, the French economy being what it is, there are not a whole lot of companies that would be likely candidates for these funds. There will be some competition between the mutual investment funds, the banks, the financial inno-

vation companies, certain financial or industrial groups and the head-hunters who want to have companies listed on the stock exchange.

Certain funds already appear to be off to a good start, for instance those sponsored by APA and the Wormser Bank. APA (Alan Patricof Associates) has already gained experience in the United States as a partner in the Apple venture. Mr Maurice Tchenio, who will manage the French fund, is determined to invest 100 percent into unlisted companies in various sectors. But until now, these funds are reserved to artificial persons. On the contrary, the more conservative funds tend to be offered to private investors. APA has also chosen the maximum period of capital lock-in (10 years) and an annual commission of 3 percent instead of the usual 7 percent. Paribas and North Credit Bank distinguish themselves especially by their desire to help cadres from large companies desirous to "get in business on their own."

As of 1 October, a total of 15 companies had been approved as managers of mutual venture investment funds. Apart from those already mentioned, there are those of the Commercial and Industrial Credit Bank, the West Industrial Credit Bank, the Lyons Credit Bank, the European Union Bank, the Private Financial Management Bank, the Worms Bank, the Marseilles Credit Bank, the Lyons Bank Company, the People's Banks, the Dreyfus Bank.

Winning the Jackpot 1 Time Out of 10

The race has started and the best will win. Let us hope that economic conditions and managers' intuition will bring the highest yields to the most daring. With 100 million francs or so a fund should invest 5 to 10 million per company, which seems modest but is actually a lot for starting companies. That should give the funds a 10-30 percent interest in the companies selected. Success must be achieved with a limited number of successful companies. It is generally considered that out of 10 companies in a mutual venture investment fund, at least 1 must become a confirmed success to enable the fund to recoup its investment several times over and make up for 9 total failures (everything lost) or partial failures (little or no gain). In the long run, therefore, salvation for a fund can come only from companies with an exceptional growth rate.

The Stock Exchange, a Logical Way Out

This triumph must bring about the disinvestment of the mutual investment fund which, after helping carry a company at arm's length, sells it to other shareholders. The logical way out is the listing of the company on the second stock exchange or at least on the over-the-counter market. This will prove the only way to assess the value of the stock beyond any contestation.

Until then, the mutual investment fund will stumble on the problem of assessing the value of unlisted stock. In other words, the liquidation value, which must be published at least once a year, will be calculated with the most extreme caution and will not reflect the true value of the fund. This is why its shareholders must commit themselves for a longer period of time so as to be there at the hour of truth, when they will get rich if they are lucky.

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